Do Health Shocks Increase Retirement More When Workers are Universally Insured?

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Abstract: Health shocks should increase retirement to a larger extent in a general tax-financed health-care system with universal access compared to an employment-contingent health insurance system. To investigate this, we compare the effect of an acute health shock on retirement among elderly male workers in Denmark, 1991-1999, to that found in a similarly-defined sample from the U.S. HRS, Coile (2004). The results show, however, that an acute health event has *less* of an impact on retirement in Denmark, the increase in the baseline retirement probability being only half as large. This difference persists even after accounting for eligibility to various early exit programs in Denmark. Neither is it explained by the relatively long duration of sickness benefits in Denmark nor by the promotion of corporate social responsibility initiatives since the mid-1990s. In the late 1990s, the difference gets even more pronounced with the introduction of the subsidized employment program (*fleksjob*) in Denmark. We are left with two plausible explanations for the observed country difference: i) that older Danes are in better health than their American counterparts and thereby less debilitated by the impact of a health shock or ii) that due to the self-reported nature of health shocks in the U.S. HRS data, justification bias inflates the estimated impacts on retirement upwards. There is little evidence to suggest that a universal health-care system like the Danish one encourages excessive retirement following a health shock.

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I. Introduction

Health shocks significantly alter workers' retirement plans, in fact more so than already existing health conditions. Dwyer and Hu (2000) find that developing a new work limitation between 2 waves of the U.S. HRS data increases the likelihood of retirement more than having a persistent limitation. Previous research by Coile (2004) finds that the shock effect of an unexpected health event such as a heart attack or the onset of a new chronic condition leads to a serious financial loss for the family mainly due to the reduced labour supply of the affected spouse, since added worker effects are small. Further, Coile and Milligan (2005) give evidence that such health shocks lead to a decline in business ownership and portfolio reduction.

The labour supply response following a health shock, however, would depend on having access to pensions and/or public and private insurance. Within an employment-contingent health insurance system, workers may be forced to continue working simply to be able to pay the costs of their treatment. Bradley et al. (2005) find that among a sample of married women, those who develop breast cancer are more likely to continue to work and even increase the intensity of labour supply following the onset of the disease. Gruber and Madrigan (1996) exploit variation in state and federal 'continuation of coverage' COBRA mandates (laws allowing individuals to continue purchasing health insurance through a former employer even after leaving the firm) to determine the impact of health insurance on retirement. They find that one year of continuation benefits increases the baseline probability of being retired by 5.4% for males aged 55-64. That is, giving older employees continued health insurance coverage reduces their need to work to cover the large costs of unexpected medical expenses. Similarly, Blau

and Gilleskie (2001) find that availability of employer-provided retiree health insurance (EPHRI) increases the exit rate from employment by 6 percentage points if the firm pays the entire cost.

When workers are universally insured, no such mitigating effect on labour supply can be expected. Therefore, we would expect that health shocks would trigger a greater amount of retirement in a general tax-financed health-care system with universal access such as the Danish one. We explore this question by estimating simple reduced-form panel retirement models, which estimate the effect on the probability of retirement of new health disturbances that occur within the sample period on data drawn from the Danish Longitudinal Registers. The aim is to compare the retirement effects of negative health shocks in a universal-insurance health care system to those found in the U.S. studies above, in particular Coile (2004), for similarly defined health conditions.

Of key importance in this area is the quality of the health data. Self-reported health has been found to be prone to justification bias, see for example Anderson and Burkhauser (1985). In the case of a health shock, however, it is argued that since individuals are less likely to misreport the presence and/or new diagnosis of a specific condition, "objective" self-reported measures serve as good proxies. Yet, new findings by Baker et al. (2004) show considerable reporting error in these so-called "objective" measures as well. We circumvent these issues by applying truly objective medical diagnoses made at the time of hospital discharge available from the Danish National Patient Registry records and merged to the register sample we use. One shortcoming of objective health measures, however, is that they need not necessarily be correlated with work incapacity, see for example Bound (1991). We focus, however, on diagnoses

made for acute discharges that are expected to impose serious work limitations such as heart attack, stroke or new cancer.

Our main result shows, surprisingly, that health shocks have *less* of an impact on retirement in Denmark than that found for the U.S. by Coile (2004) based on a similarly-defined sample drawn from the HRS with the same controls. In fact, the increase in the baseline retirement probability following an acute health shock is 16% in the U.S. and exactly half this level, 8% in Denmark. This result is further surprising given the acute nature of health shocks in the Danish data which are defined on the basis of diagnoses made at the time of hospitalization compared to the self-reported health incidents in the HRS. We test several potential explanations behind this difference. The rest of the paper is organized as follows: Section II discusses the data, Section III presents in brief the estimation method, Section IV the results, Section V discusses the implications of the results for the central hypothesis and Section V concludes.

II. Data and descriptives

The data used in this paper are obtained from a huge Danish longitudinal register database that includes yearly information on all persons aged over 44 years from 1980 to 2001. In addition, information on spouses/co-habitants (even those 44 and under) is included over the entire period. All in all about 3.5 million persons. The database contains a large number of variables, including information on demographics, individuals' labor market characteristics, financial aspects, transfer payments, and objective health measures. The health measures are merged in from the National Patient Registry, which has collected data on all 24-hour somatic hospital admissions since

1977 and since 1995, on part-time patients, out-patients and emergency patients as well. Information on 24-hour patients is used here. For each of these patient contacts, there is information on the hospital department admitting the patient, the diagnoses made, surgical procedures, date of admission, date of discharge and mode of admission (acute/non-acute).

Health shocks are defined on the basis of diagnoses. In our data, diagnoses are classified according to the ICD-8 system before 1994 and according to the ICD-10 system after. In particular, we focus on hospitalization due to a particular type of health shock, namely acute health events (heart attack, stroke, new cancer). An individual might be admitted to a hospital several times during a year. Moreover, more than one diagnosis might be attached to a particular admission. If more than one admission is recorded for an individual during a year, we focus on the first one. If more than one diagnosis is attached to this admission, we concentrate on the diagnosis which, according to the WHO's international guidelines, can be characterized as the main condition.

In the first step, we compare the effect of health shocks on men's retirement in Denmark and the U.S. The results for the U.S. are obtained from a paper by Coile (2004). This analysis uses the first six waves, 1992-2002, of the Health and Retirement Study (HRS), which is a national biennial panel survey of persons born between 1931 and 1941 and their spouses. Coile's results are based on a sample of married male workers that are between the ages of 50 and 69, are present in the sample in wave 1, are observed for at least two consecutive years and were working in the previous wave. All in all, the sample consists of five two-wave periods based on 6 waves of data (wave 1-2, wave 2-3, wave 3-4, etc). For full comparability, we have constructed a dataset that is as

similar as possible to that used by Coile. While Coile's sample consists of 11,006 person-wave observations, 144,511 person-wave observations are included in our sample.

In Coile's data, retired persons include individuals that characterize themselves as retired. In the Danish data, the definition of retirement is based on yearly information on the labour market status by the end of November. We choose to operate with the widest definition of retirement as possible so that retired individuals include those whose labour market status is given as receiving (early or normal) retirement benefits or social disability pension or are outside the labour market. In the analyses for both countries, controls are added for chronic illness, accidents, age, education, industry/occupation, year and financial aspects. As far as possible, the same reference categories are defined as in the study by Coile (2004).

The construction of the samples differs in two ways: First, as data from 2002 have only recently been added to the register sample and are in need of further cleaning, for the time being, we look at the period 1991-2001. Second, our sample is not restricted to married men, but includes all working men. These differences are not expected to affect the results of the comparison of the two countries.[1] However, other differences in data might influence the results of the comparison. While our health measures are truly objective since they are obtained from administrative registers, these measures are self-reported in the study for the U.S.. If justification bias is present in the data for the U.S., that is, if a health shock is used as a socially acceptable excuse for retirement rather than an accurate description of the reason why individuals leave the labour market, the

[1] A comparison of the estimation results between men in general and married men in Denmark shows that, based on 6 waves, the estimated impact of a health shock on the baseline retirement probability of married men is 0.077 (0.009) and based on 10 waves, 0.070 (0.008). The corresponding results for all men in general are: 6 waves: 0.080 (0.009) and 10 waves: 0.075 (0.008), see Table 2.

estimated effect of health shocks on retirement might be larger in the U.S. than it would otherwise have been. Further, in the case of Denmark, we only look at one diagnosis (the first) each year. The HRS queries individuals about the occurrence of *any* type of health shock (heart attack, stroke, new cancer) since the last wave, so multiple shocks are allowed per individual per period. This difference in the definition of health shock might contribute to explaining the much larger incidence of health shocks in the U.S. sample. It should not, however, affect the estimation results which in both countries are based on a simple dummy variable for the incidence of a health shock in a given period and not on the exact count of health shocks.

In the next step of our analysis, we extend our sample to include information on every wave (year) in the period 1991-2001 as the Danish registers are updated on an annual basis. Thereby, we construct nine two-wave periods based on 10 full waves of data (1991-1993, 1992-1994, 1993-1995 etc.). This extended sample consists of 254,393 person-wave observations.

Appendix Table 1 shows summary statistics for the background variables in the Danish sample. Table 1 compares the means on key variables across the Danish and U.S. HRS samples. For comparability purposes, we first take means over all person-year observations in the 5 two-wave periods in line with the biennial HRS sampling framework. In the next set of means, we include the intervening years expanding the sample from 145,000 to 254,000 person-year observations. The means, however, do not deviate much across the two samples. In both cases, 16.8% of the sample in Denmark exits the labour force through retirement over this period compared to 18.5% in the HRS. One reason for this difference in raw means could be that our sample is 2 years younger on average than the HRS sample, 58 years compared to 60 years. Another

significant difference is that while 6.7% of the HRS sample experience a health shock over the period, the corresponding figure in the Danish case is only 1.7%, a difference probably due to the self-reported nature of health shocks in the HRS compared to the medically diagnosed health events in conjunction with hospitalization present in the Danish data plus that we only allow for one health shock (the first) per period.

III. Empirical Model

We estimate simple reduced-form pooled retirement probability models with cluster-adjusted standard errors of the form:

$$R_{i,\,t+2} = \alpha + \beta\, HS_{i,\,t} + \gamma' X_{i,\,t} + \varepsilon_{i,\,t}$$

where R is the probability of retirement two periods later, HS is a dummy for the occurrence of a health shock in the interval $[t,\ t+2]$ and X is a vector of other controls which include dummies for chronic illness, the occurrence of accidents, age, educational categories, industry/occupation indicators, year (or period) and wealth. These controls are chosen as far as possible to be identical to Coile (2004), who also has dummies for chronic illness, accidents, age, education, industry/occupation, year and net worth and liquid assets. Both linear probability (LPM) and Probit models of retirement probability are estimated but as the Probit results are nearly identical to the LPM, the former remain the chosen specification.

To allow for time-constant, individual-specific unobserved heterogeneity, fixed effects models are also estimated alongside the LPM and Probit models. These results, however, are not the focus of the current analysis. Our focus is a comparison to the

Coile (2004) study which did not estimate such models, and therefore, they are not discussed here, see Table 2.

IV. Results

Table 2 presents the findings on the key variables of the basic model. For the other model estimates, see Appendix Table 2. According to Coile's estimates based on the HRS, an acute health event (heart attack, stroke or new cancer) raises older male workers' baseline retirement probability by 16%. In the equivalent Danish sample, however, this figure is only half as large, 8%, both in the linear probability model (LPM) as well as in the Probit specification. This result holds even when moving to the expanded Danish sample based on 10 waves. All future estimations, therefore, are based on this expanded sample.

To explore more closely the reason for this obvious country difference in the impact of a health shock, three potential explanations are tested. First, we test whether the multitude of early exit options in the Danish welfare state may be siphoning out low wage/low SES workers from the labour market, a group for whom the replacement rate from early retirement pensions is high (see for example Bingley et al. 2004). This type of selection may imply that the composition of the labour force at older ages in Denmark compared to the U.S. could be different and made up of predominantly high SES, white-collar workers in relatively better health who are more able to return to work following a health shock. For example, the medical literature shows that pre-existing comorbidities such as cardiac disease and poorer physical functioning are

strongly related to worse work-related outcomes following myocardial infarction (McBurney et al. 2004). Among stroke patients, studies show that workers from white-collar occupations show a higher tendency to return to work (Saeki et al, 1995).

To test this selection hypothesis, in Table 3 we show results from re-estimating the basic model including indicators for eligibility to successively, the Transitional Benefits Program (TBP) and the Voluntary Early Retirement Program (VERP).

TBP is an early retirement program for the long-term unemployed that was open to the 55(50)-59 age-group in the years 1992(94)-1996, eligibility being based on age, membership in an unemployment insurance fund and previous unemployment experience. The VERP is an early retirement program which is open to workers starting from age 60, eligibility being based on (besides age) continuous unemployment insurance membership for a number of years.[2] The Danish register data allows us to identify unemployment insurance membership as well as previous unemployment experience. Based on these, we create indicators for TBP and VERP eligibility which are added to the basic model. The results in Table 3 show that controlling for neither TBP nor VERP eligibility increases the baseline retirement probability and the impact of a health shock on retirement in Denmark remains around 7.5%.

Second, it may be the case that the relatively long duration of sickness benefits in Denmark (up to one full year within a 3-year window) allows workers with health problems to remain on the employment rolls for a longer period than workers in the U.S., for example. As the observation window following a given health shock is two

[2] Immediately following its introduction in 1979, the VERP became the most popular form of retirement among mainly blue-collar workers in Denmark resulting in a tremendous decline in the labour force participation rate in the 60-66 age group. For males, this rate dropped some 20 percentage points in the year after its introduction and another 20 percentage points over its maturity phase, see Bingley et al. (2004). The VERP has undergone a number of reforms, including an extensive reform in 1999. Previous studies find little evidence that reforms of the VERP have had a delaying impact on early retirement, see Larsen (2005).

years, the existence of a lengthy sickness benefits period may lead to an underestimation of the impact of a health shock on retirement. Only 794 individuals, however, are classified as receiving sickness benefits in the first year in the observation period. Omitting these cases from the sample does not move the estimated impact perceptibly (see Table 4).

Welfare state economies have, for many decades, had to confront the problem of large numbers of employable individuals being supported by public income transfers, even in more recent times when unemployment has been historically low. In the 1990's two types of employment-enhancing initiatives were targeted in Denmark. One of these was *activation*, and the other, particularly relevant for the current analysis, was *corporate social responsibility* (CSR), see Rosdahl (2000). CSR was formally launched by a campaign undertaken by the Danish Ministry for Social Affairs in 1994**.** CSR emphasizes, among other things, the prevention of social problems which can lead to expulsion from the workplace and the retention of the long-term sick or disabled on the job. To test whether the promotion of CSR could have led Danish employers to make extra efforts to retain workers with health problems, we re-estimate the basic model by splitting the sample into pre and post-1994 regimes. The results (in Table 5, top panel) show that there is no difference in the estimated impact of a health shock on retirement in the pre-CSR versus the post-CSR regimes. This is the case even when the sample in both regimes is restricted to have the same age-distribution.

A related labour market program which focused on the retention of workers with health problems was the subsidized jobs program or *fleksjob*, introduced in 1999. As part of a move to create a more "spacious" labour market, employers were given wage subsidies to create special sheltered jobs with softer, more flexible working conditions

in order to be able to accommodate individuals with health problems. The take-up of subsidized jobs has been high[3], although this affects mostly the later years of our sample period. When splitting the sample into pre and post-*fleksjob* regimes, it can be seen in Table 5, bottom panel, that the effect of an acute health event is significantly smaller, 3.3% following the creation of the subsidized jobs program. When restricting the age distribution to be the same in the pre and post-*fleksjob* regimes, however, the effect is still 3% but no longer significant. So, the introduction of sheltered jobs seems to reduce the likelihood of retirement following a health shock, although this effect is not always precisely estimated and only arises in the last two years of the sample period.

One other feature of the Danish welfare state that we consider only partially in the current analysis is disability pension. Our definition of retirement includes exit through disability pension. We cannot rule out, however, that due to the generosity and somewhat easier access to disability pension (eligibility criteria have been made stricter, though, in recent years) that many older Danes with health problems may have already withdrawn themselves before the start of the sample period, so that those in the labour force may constitute a more selected group, health-wise, than comparable Americans[4]. In future work, we plan to take this aspect into account.

In sum, we test a number of institutional explanations that could underlie the sizable difference in retirement effects of health shocks across the two countries. But the country difference persists nonetheless and becomes even more pronounced in the later years.

[3] In 2001, 6,000 individuals (half of these, men) were on subsidized jobs. By 2005, the number had increased to 19,000 of which 9,000 were men.

[4] Disability retirement is in fact not a very widely-used path in the U.S. where the majority of older individuals transit directly to receipt of SS benefits from full-time work at the early or normal ages. According to the Social Security Administration's SS Bulletin, 1998, in the 50-54 age group, only 6% of men receive disability; at ages 55-59, this figure is 9% and at ages 60-64, 12.9% (Coile and Gruber, 2004). By way of comparison, in Denmark in 2000, 11.3% of the 50-59 age group and 13.6% of the 60-64 age group retired through disability pension.

V. Discussion

In Section IV, the data allowed us to test whether the institutional design of the Danish welfare state including early retirement programs, sickness benefits and corporate or state-funded retention measures were the reasons behind the observed country difference. But this does not seem to be the case. In this section, we discuss some residual explanations which we are unable to test directly.

First, could it be that the Danish health care system is better than that of the U.S., so that individuals with acute health problems in Denmark receive higher quality care and are more easily rehabilitated than their American counterparts? This is doubtful, given anecdotal evidence on short-staffed hospitals and long waiting times for even acute care needs in Denmark. Some evidence in this area is provided by Cutler and Mas (2006) who compare non-fatal health outcomes across U.S, Canada, U.K. and Spain and find that while the U.S. medical system does worse in treating some chronic diseases such as diabetes compared to the other countries, it provides better acute care, particularly for heart diseases.

We also do not test whether distinct selection mechanisms in play in the U.S. draw out the relatively healthy workers from the labour market early, for example high-income/SES individuals with adequate private pension savings which could explain the relatively stronger effect of health shocks on retirement in the U.S., in the light of the importance of comorbidity and general health status discussed earlier in Section IV. The available evidence in this area, however, suggests the opposite - that those with high discount rates, low assets and poor health often retire at 62 (see Gustman and Steinmeier, (2004)). Related to this, is the potential problem of attrition from the U.S.

HRS data. If health-related attrition was present, however, it would bias the results in the opposite direction.

A remaining factor, however, is that older American men in general might be in worse physical health than similar Danish men, particularly where heart problems, high blood pressure and diabetes is concerned, see the evidence based on SHARE and HRS in Appendix Table 3. Further, the prevalence of obesity is higher in the US compared to Denmark (30 vs. 16 percent), see Michaud and van Soest (2005) and obesity has been found to be an important precursor to illness (Smith (2003), Goldman et al, (2004)). To some extent these country differences in health may also reflect a different racial and socioeconomic composition across the two countries, as much previous confirms the existence of a strong SES gradient in health (Marmot (1999) for example) as well as important health disparities in outcomes and access to health care across racial groups (Keppel et al. (2004)). Differential health in the two samples might affect the results of our comparison. This is particularly the case if poor underlying health in terms of comorbidities and poorer physical functioning make it more different to recover after an acute health event and thereby to return to work.

Finally, it cannot be ruled out that due to the self-reported nature of health shocks in the U.S. HRS data, justification bias is present and inflates the estimated impacts of health shocks on retirement in the U.S. upwards. While our health measures are truly objective since they are obtained from administrative registers, if individuals in the U.S. HRS sample tend to use a health shock more as a socially acceptable excuse for retirement rather than an accurate description of the reason why they leave the labour market, the estimated effect of health shocks on retirement might be larger than it would otherwise have been.

VI. Conclusions

This paper compares the effect of an acute health shock on retirement among elderly male workers in Denmark, 1991-1999, to that found in a similarly-defined U.S. sample from the HRS over the same period (Coile 2004). The results show, however, that an acute health event has *less* of an impact on retirement in Denmark, the increase in the baseline retirement probability being only half as large. This difference persists even after accounting for eligibility to various early exit programs which may be drawing out low wage/low SES workers with poorer general health in Denmark. Neither is it explained by the relatively long duration of sickness benefits in Denmark nor by the promotion of CSR initiatives in the mid-1990s. In the late 1990's, however, the difference becomes more pronounced with the introduction of the subsidized employment program (*fleksjob*) in Denmark giving employers wage subsidies to create softer jobs/flexible working conditions for individuals with health problems.

We are left with two plausible explanations for the country difference: i) that older Danes are possibly in better health than their American counterparts and thereby less debilitated by the impact of a health shock. Indeed, obesity (an important precursor of illness) as well as the incidence of ischemic heart diseases is significantly lower among older Danes and/or ii) that due to the self-reported nature of health shocks in the U.S. HRS data, justification bias inflates the estimates of a health shock on retirement upwards. In any case, there is little evidence to suggest that a universal health-care system like the Danish one encourages excessive retirement following a health shock.

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Tables

Table 1.
Summary Statistics of Health and Labour Force Status. Men. U.S., 1992-2002 and Denmark 1991-2001.

	US (Coile, 2004)		Denmark (Datta Gupta & Larsen)			
	6 waves		6 waves		10 waves	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Exited Labour Force	0.185		0.168		0.168	
Acute Health Event	0.067		0.017		0.017	
Chronic Illness	0.107		0.027		0.027	
Accident	0.036		0.016		0.016	
Age	60.4	4.1	57.8	3.6	57.9	3.5
No. of person-wave obs.	11,006		144,511		254,400	

Table 2.
Effect of Own Health Shock on Retirement. Men. U.S. and Denmark.

	US (Coile, 2004)	Denmark (Datta Gupta & Larsen)					
	6 waves	6 waves			10 waves		
	LPM	LPM	Probit	FE	LPM	Probit	FE
Acute Health Event Dummy	0.161 (0.018)	0.080 (0.009)	0.078 (0.009)	0.039 (0.009)	0.075 (0.008)	0.073 (0.007)	0.026 (0.006)
R^2	0.111	0.118	0.143	0.217	0.119	0.145	0.200
No. of person-wave obs.	11,006	144,508			254,393		

Note: LPM: Linear Probability Model. Probit: Marginal effects are reported. FE: Fixed Effects.
Regressions for the US include dummies for chronic illness, accident, age, education, industry/occupation, and year, net worth and liquid assets.
Regressions for Denmark include dummies for chronic illness, accident, age, education, industry/occupation, year and wealth. Standard error in parentheses.

Table 3.
Effect of Own Health Shocks on Retirement. Men. Denmark. Linear Probability Model.

	Denmark (Datta Gupta & Larsen)	
	Control for TBP eligibility Added	Control for VERP eligibility added
Acute Health Event Dummy	0.075 (0.008)	0.073 (0.007)
R^2	0.119	0.173
No. of person-wave obs.	254,393	254,393

LPM: Linear Probability Model. Probit: Marginal effects are reported. Regressions include dummies for age, education, industry/occupation, year (excluded, when the unemployment rate variable is included) and wealth. Standard error in parentheses.

Table 4.
Effect of Own Health Shocks on Retirement. Men. Denmark. Linear Probability Model.

	Denmark (Datta Gupta & Larsen)
	10 waves
	Sample restricted to individuals not receiving sickness benefits in first year in the period (while working)
Acute Health Event Dummy	0.075 (0.008)
R^2	0.119
No. of person-wave obs.	253,499

LPM: Linear Probability Model. Probit: Marginal effects are reported. Only 794 individuals receive sickness benefits in the first year in the period. Standard error in parentheses.

Table 5.
Effect of Own Health Shocks on Retirement. Men. Denmark. Linear Probability Model. The effect of Corporate Social Responsibility (CSR) and subsidised jobs.

	Denmark (Datta Gupta & Larsen)			
	10 waves			
The effect of CSR				
	Without age restriction		With age restriction (52-61 years)	
	Pre-1994	Post-1994	Pre-1994	Post-1994
Acute Health Event Dummy	0.076 (0.013)	0.075 (0.008)	0.078 (0.014)	0.080 (0.009)
R^2	0.198	0.114	0.197	0.125
No. of Person-Wave Obs.	43,681	210,712	38,597	171,303
The effect of subsidised jobs				
	Without age restriction		With age restriction (58-67 years)	
	Pre-1999	Post-1999	Pre-1999	Post-1999
Acute Health Event Dummy	0.082 (0.008)	0.033 (0.020)	0.089 (0.012)	0.031* (0.020)
R^2	0.128	0.064	0.071	0.064
No. of person-wave obs.	220,932	33,461	104,870	32,403

LPM: Linear Probability Model. Probit: Marginal effects are reported. * Coefficient not significant at a 10% level. Standard error in parentheses.

Appendix

Table A.1.
Summary Statistics of background variables. Male workers aged 50-69, in the period 1991-2001, 6 waves, Denmark.

	Denmark	
	Mean	Std. Dev.
Age	57.8	3.6
Basic education	0.400	0.49
Vocational education	0.388	0.49
Short education	0.030	0.17
Medium education	0.109	0.31
Long education, university degree	0.072	0.26
Ph.D. and Doctor degree	0.001	0.03
Log wealth, US $, 2000-prices	0.511	0.26
Period 1991-1993	0.302	0.46
Period 1993-1995	0.244	0.43
Period 1995-1997	0.194	0.40
Period 1997-1999	0.152	0.36
Period 1999-2001	0.108	0.31
Self-employed	0.226	0.42
Salaried worker, highest level	0.324	0.47
Salaried worker, medium level	0.107	0.309
Salaried worker, basic level	0.175	0.280
Salaried worker, lowest level	0.167	0.37
Assisting spouse	0.001	0.04
Primary industries	0.050	0.21
Manufacturing	0.094	0.29
Construction	0.057	0.23
Wholesale, retail	0.130	0.34
Financing and private services	0.095	0.29
Hotels, restaurants	0.018	0.13
Transportation, postal and telegraph services	0.050	0.22
Public sector	0.234	0.42
Missing information about industry	0.275	0.45
No. of person-wave obs.	144,511	

Table A.2.
Effect of Health Shocks on Retirement. Men. 6 waves. Linear Probability Model.

	Coefficient	Standard error
Acute Health Event Dummy	0.080	0.009
Chronic illness	0.070	0.007
Accident	0.022	0.008
Age 51 in 1991	0.039	0.003
Age 52 in 1991	0.075	0.003
Age 53 in 1991	0.110	0.003
Age 54 in 1991	0.136	0.003
Age 55 in 1991	0.173	0.004
Age 56 in 1991	0.206	0.004
Age 57 in 1991	0.262	0.005
Age 58 in 1991	0.323	0.006
Age 59 in 1991	0.306	0.006
Age 60 in 1991	0.318	0.007
Basic education	0.051	0.025
Vocational education	0.061	0.025
Short education	0.033	0.025
Medium education	0.037	0.025
Long education, university degree	-0.020	0.025
Log wealth, US $, 2000-prices	-0.007	0.003
Period 1991-1993	-0.227	0.004
Period 1993-1995	-0.180	0.004
Period 1995-1997	-0.132	0.004
Period 1997-1999	-0.067	0.004
Self-employed	-0.072	0.027
Salaried worker, highest level	-0.003	0.027
Salaried worker, medium level	0.043	0.027
Salaried worker, basic level	0.080	0.027
Salaried worker, lowest level	0.072	0.027
Primary industries	-0.025	0.009
Manufacturing	-0.017	0.008
Construction	-0.018	0.009
Wholesale, retail	-0.016	0.008
Financing and private services	-0.007	0.008
Transportation, postal and telegraph services	0.010	0.009
Public sector	-0.010	0.008
Missing information about industry	-0.020	0.009
Constant	0.135	0.037
R^2	0.118	
No. or person-wave obs.	144,508	

Note: Reference age: 50 in 1991, reference wave: first period (1991-1993), reference education: Ph.D. or a Doctor degree, reference occupation: working as an assisting spouse, reference industry: hotels and restaurants.

Table A.3.
Health outcomes for the 50+ population of men in the U.S. (2002) and Denmark (2004).

	U.S.	Denmark
Heart problems	0.207	0.093
High blood pressure	0.483	0.308
Stroke	0.052	0.054
Diabetes	0.176	0.086
At least one limitation in ADL	0.098	0.050
At least one indication of an emotional health problem	0.495	0.632
Self-reported health: Very poor or poor	0.212	0.235

Source: Michaud and van Soest (2005). Notes: ADL: Activities of daily living. Emotional health problems are measures on a CESD scale.